

design of reinforced concrete arches are taken up; after a brief explanation of the elastic theory and its application to the determination of the stresses in any arch, Thacher's formulæ for reinforced concrete arches are given, and their use in practice explained by the help of three typical examples of such arches, a highway bridge of two spans, each of $42\frac{1}{2}$ feet, a single-line railway bridge of 72-feet span, and, lastly, a small semicircular arch culvert of 15 feet span. These three examples are completely worked out, the necessary graphical constructions being shown in full in three plates; this chapter will undoubtedly be found very useful to any engineer who is engaged in the design of such arches.

Parts ii. and iii. are the work of Mr. Hill, and deal respectively with representative structures and methods of construction; the following branches of work are dealt with:—foundations of various types, including reinforced concrete piles, floors, walls and arches in buildings, and columns. The illustrations selected, though largely American, include also a number of cases of work carried out in Europe on the Hennebique system. The application of reinforced concrete to large bridges and culverts is illustrated by a number of structures which have recently been put up in France on the Monier system, and it may be pointed out that some hundreds of bridges of this type have now been erected, principally in Germany and Austria.

The last section of the book, on methods of construction, is naturally largely taken up with the description of the various forms necessary in elaborate reinforced concrete work. The future security of the work depends entirely upon the care with which the forms are designed and erected, and the economy of the work is largely dependent upon forms so designed that they can be rapidly put into position, readily taken down, and readily re-erected on a fresh section of the work. Many valuable hints and labour-saving suggestions will be found in this portion of the book. The author has evidently based this section upon experience of a very varied character in the erection of reinforced concrete structures.

(5) This is another of the somewhat numerous text-books which have appeared within the last few months dealing with the important subject of reinforced concrete. The author points out that the use of steel merely embedded in stone or concrete, as in the well known skeleton system of construction, does not develop the best properties of each of these materials—reinforced concrete alone enables full advantage to be taken of the special qualities of both the steel and the concrete.

The first portion of the book deals with the physical properties of the two materials, concrete and steel, and a number of carefully selected tables is given of tests of these materials. The general theory of concrete-steel beams is then considered, and special emphasis is laid upon the necessity of an accurate knowledge of the moduli of elasticity.

We are afraid, however, that the author has fallen into confusion of thought in discussing the question of the position of the neutral axis; on p. 43 he refers

to an imaginary beam of concrete and steel, and appears to consider that each square inch of the concrete will carry the same total stress, ignoring altogether the variation in intensity of stress with distance from the neutral axis; and again, in chapter iv., when discussing the position of the neutral axis, he states that the position of this is affected by the fact that the compressive strength of the material (concrete) is greater than its tensile strength. Surely there is confusion here between strength and modulus of elasticity, and this confusion seems to run through all the rules and calculations for the position of the neutral axis. This portion of the book certainly requires to be carefully revised if it is to become a trustworthy text-book on the subject.

The subject of floor design in concrete and steel is taken up, several large floors constructed on the Hennebique system are fully described, and tables are given of working stresses which can be allowed, and the building rules which have been laid down by various authorities in connection with the design of such floors. The application of reinforced concrete to foundation work in bad soils is discussed, and the author shows that by the use of this type of construction the depth to which the foundation must be taken can be very considerably reduced. The last chapter discusses the construction of reinforced concrete columns, special attention being given to Considère's hooping method.

CHEMISTRY FOR SCHOOLS.

Notes on Volumetric Analysis. By J. B. Russell and A. H. Bell. Pp. viii+94. (London: John Murray.) Price 2s.

Introduction to Chemical Analysis. By Hugh C. H. Candy. Pp. xii+114. (London: J. and A. Churchill, 1905.) Price 3s. 6d. net.

An Elementary Text-book of Inorganic Chemistry. By R. L. Whiteley. Pp. viii+245. (London: Methuen and Co.) Price 2s. 6d.

Elementary Chemistry, Progressive Lessons in. By F. R. L. Wilson and G. W. Hedley. Pp. xii+168. (Oxford: The Clarendon Press, 1905.) Price 3s.

A Three Years' Course of Practical Chemistry. By George H. Martin and Ellis Jones. Pp. viii+112. (London: Rivingtons, 1906.) Price 2s.

IT seems to have become a recognised practice for schools and colleges to produce their own small text-books or notes on some portion of the science curriculum, first for internal use, and then for the benefit of outsiders. Whether this multiplication of little books is desirable is somewhat questionable. Without going so far as to say that these small books conduce to cramming or getting through examinations, there is always a slight lurking suspicion about this point. Our various "examination" boards are perhaps answerable for the small book production.

Mr. Russell's book is intended, no doubt, for use on the working bench. The directions for working are short, mainly to the point and in logical order, but surely they are too frequently repeated.

After about twelve pages of instructions and examples on the use of permanganate, the student is still told to weigh out so much ferrous salt, make up to so much, &c.; little room is left for the student to think and find out for himself.

After the idea of "normal solution" has been once grasped, many of the directions might be left out. One somewhat objectionable point noted is the direction to weigh out a certain definite quantity of a substance, say 5.3 grams. This is not an easy matter for beginners. It is better to take a weighed quantity and make up solution to the desired strength by addition of the calculated proportion of water.

The ground covered ranges from acid and alkali through permanganate to silver and thiosulphate, preceded by a good description of the use of the burette, &c. The book will no doubt be useful, especially with large classes where the instructor is not able to get rapidly around to the students.

The preface of Mr. Candy's book informs us that the methods and processes of analysis and synthesis have been chosen to meet the requirements of students preparing for parts i. and ii. of the preliminary scientific examination in the University of London and the first examination of the joint board. After a sensible introduction, chapters follow on the identification of bases and acids, methods of separation and tests of purity, and a very useful chapter on preparations. In the latter section are included examples of preparations of mineral salts, acids, esters, alcohol derivatives, &c. The processes of taking a melting point and a boiling point might have been illustrated by a sketch. The preparation method for aldehyde is somewhat dangerous in inexperienced hands. It is safer to drop alcohol, very slowly, into the warm bichromate mixture and distil off the aldehyde as fast as formed. Some short chapters on equivalent and volumetric operations complete the book. The matter is clearly expressed, and the book will be useful for the class of students for whom it is intended.

The first forty-two pages of Mr. Whiteley's book deal with physical changes and physical properties. The book is rather freely illustrated by diagrams of apparatus, and the descriptions and explanations are generally quite clear, full, and understandable. It is designed for the use of those studying elementary chemistry on the lines of the Board of Education syllabus. The purely chemical sections include air, water, common salt, chemical theories, compounds of nitrogen, carbon and sulphur. There are appendices on solubilities of salts, questions and answers to calculations. The book should be very useful, especially to students unable to attend courses of experimental teaching or lectures.

The volume by Messrs. Wilson and Hedley is intended as a school course for beginners. It is entitled "Elementary Chemistry," but a large part of the book is concerned with necessary matters of elementary physics, such as measuring, length, areas, volume, the thermometer, density, solution, evaporation and boiling, Boyle's law, &c. The book is simply and clearly written, and illustrated by useful

diagrams. Strictly speaking, there is no chemistry in the book, but we think all boys intending to commence that subject would benefit exceedingly by working through the excellent course here given.

The plan of instruction set forth by Messrs. Martin and Jones is to perform some experiments on a given substance such as mixing "sal ammoniac with quicklime and heating in a test tube." The inquiring student is then required to write out an account of what he notices, and to compare the results with those obtained when one of the substances is heated alone. Commenced with moderately young students who have not the bogey of an examination paper, or a particular syllabus, throwing a baleful shadow over them, this plan should produce excellent results. The book could scarcely be used to full advantage by students working alone, but with a sympathetic teacher at hand to fill in necessary explanations we think the volume a valuable addition to the host of books already available.

W. R. H.

CERTAIN MODERN VIEWS ON PATHOLOGY

Introduction à la Pathologie générale. By M. Félix le Dantec. Pp. x+504. (Paris: Félix Alcan, 1906.) Price 15 francs.

IN this work the author has grouped together a large and heterogeneous mass of information and speculation, always interesting and always fascinating. The first line of his introductory remarks leads us from the tubercle bacillus to the Milky Way, from the infinitely small to the immeasurably large, and we are soon assured that everything that exists in this formidable interval of space can be subject to investigation, provided it, in any way, can influence us. This promise holds good for everything, from an earthquake on the satellite of Sirius to an analogous occurrence in the interior of an electron; and so on, until after forty pages of pleasant reading we learn that the object of the book is principally to support the views of M. Bordet "and some others" as to the question of immunity. The theories of Ehrlich and his followers give a purely chemical interpretation of the facts of immunity, and are unsatisfactory inasmuch as they confound colloidal changes with chemical changes, properly so called. Ehrlich's views, he says, threaten to become to general pathology what Weismann's have been to biology.

"It is always dangerous to give names to things which do not exist—this is to create entities, of which it will afterwards be found extremely difficult to disembarass oneself."

The author divides his book into two great sections. In the first he desires to advance slowly, to return frequently to the same subjects, so as not to come into too violent collision with the habit of thought of those who have for a long time been familiarised with the language of chemistry; also to give a short account of such of the properties of colloids as may be of interest to the biologist, and to sketch the main lines of the physical theory of serotherapy. Thus he leads the reader to the "notion" of the three heredities, chemical, physical, and symbiotic heredity. The